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Role of Coblation in Otolaryngology  
A Supplement



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# Role of Coblation In otolaryngology

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## Coblation the physics behind it

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### Introduction:

The technology of using plasma to ablate biological tissue was first described by Woloszko and Gilbride <sup>1</sup>. By their pioneering work in this field they proved that radio frequency current could be passed through local regions of the body without discharge taking place. Radio frequency technology for medical use (for cutting, coagulation and tissue dessication) was popularized by Cushing and Bovie <sup>2</sup>. Cushing an eminent neurosurgeon found this technology excellent for his neurosurgical procedures. First use of this technology inside the operating room took place on October 1<sup>st</sup> 1926 at Peter Bent Brigham Hospital in Boston, Massachusetts. It was Dr Cushing who removed a troublesome intracranial tumor using this equipment.

Coblation is non-thermal volumetric tissue removal through molecular dissociation. This action is more or less similar to that of Excimer lasers. This technology uses the principle that when electric current is passed through a conducting fluid, a charged layer of particles known as the plasma is released. These charged particles have a tendency to accelerate through plasma, and gain energy to break the molecular bonds within the cells. This ultimately causes disintegration of cells molecule by molecule causing volumetric reduction of tissue.

Medical effects of plasma have spurred an evolution of new science "Plasma Medicine". It is now evidently clear that Plasma not only has physical effects (cutting and coagulation) on the tissues but also other beneficial therapeutic effects too. Plasma not only coagulates blood vessels but also decontaminates surgical wound thereby facilitating better wound healing. Therapeutic application of plasma assumes that plasma discharges are ignited at atmospheric pressure.

### Plasma Medicine:

This field of medicine can be subdivided into:

1. Plasma assisted modification of biorelevant surfaces

2. Plasma based decontamination and sterilization

3. Direct therapeutic application

Plasma assisted modification of biorelevant surfaces:

This technique is used to optimize the biofunctionality of implants, or to qualify polymer surfaces for cell culturing and tissue engineering. For this purpose gases that do not fragment into polymerisable intermediaries upon excitation should be used. Gases that do not fragment include air, nitrogen, argon, oxygen, nitrous oxide and helium. Exposure to such plasma leads to new chemical functionalities.

Plasma based decontamination and sterilization:

Not all surgical instruments can be effectively sterilized using currently available technologies. This is due to the fact that plastics cannot be effectively be sterilized by conventional means as it could get degraded on exposure to steam and heat. Plasma discharges have been found to be really useful in this scenario because of its low temperature action. The nature of plasma actions on bacteria extends from sublethal to lethal effects. Sublethal effects cause bacteriostatic changes, while lethal effects cause bacteriocidal changes.

Direct therapeutic application:

This is purely surgical application both in otolaryngology and orthopaedic surgeries. Plasma is used to ablate tissue with minimal bleeding.

A broad spectrum of plasma sources dedicated for biomedical applications have been developed. These include:

1. Plasma needle<sup>3</sup>
2. Atmospheric pressure plasma plume
3. Floating electrode dielectric barrier discharge
4. Atmospheric pressure glow discharge torch
5. Helium plasma jets
6. Dielectric barrier discharge
7. Nano second plasma gun



Figure showing plasma needle. The glow is cold enough to be touched

Dielectric barrier discharge:

This is the technology used in therapeutic coblators. This is characterised by the presence of at least one isolating layer in the discharge gap<sup>4</sup>.



Image showing coblator wand with three electrodes separated by ceramic

For effective use of this technology for surgical procedures the plasma generated by the wand / electrode should be uniform.<sup>5</sup> The uniformity of plasma can be ensured by:

1. Increasing preionization of the gas thus ensuring generation of more avalanches
2. Shortening of voltage rise time

Therapeutic applications of plasma:

Plasma treatment is known to cause coagulation of large bleeding areas without inducing additional collateral tissue necrosis. Other methods causing coagulation act thermally producing a necrotic zone around the treated spot. Non thermal coagulation is caused due to release of Na and OH ions which causes release of thrombin.

Coblation technology is widely used in the field of otolaryngology for performing:

1. Tonsillectomy
2. Adenoidectomy
3. UPPP
4. Tongue base reduction
5. Turbinate reduction
6. Kashima procedure for bilateral abductor paralysis
7. Papilloma vocal cords

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## Coblation an overview

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### Abstract:

The term coblation is derived from “Controlled ablation”. This procedure involves non-heat driven process of soft tissue dissolution using bipolar radiofrequency energy under a conductive medium like normal saline. When current from radiofrequency probe pass through saline medium it breaks saline into sodium and chloride ions. These highly energized ions form a plasma field which is sufficiently strong to break organic molecular bonds within soft tissue causing its dissolution. This article attempts to provide a broad overview of the technology and its uses in the field of otolaryngology.

### Introduction:

Coblation (Controlled ablation) was first discovered by Hira V. Thapliyal and Philip E. Eggers. This was actually a fortuitous discovery in their quest for unblocking coronary arteries using electrosurgical energy. In order to market this emerging technology these two started an upstart company ArthroCare. Coblation wands were exhibited in arthroscopy trade show during 1996. Initially coblation technology was used in arthroscopic surgeries immensely benefiting injured athletes.

### Technology overview:

Coblation technology is based on non heat driven process of soft tissue dissolution which makes use of bipolar radio frequency energy<sup>1</sup>. This energy is made to flow through a conductive medium like normal saline. When current from radiofrequency probe passes through saline medium it breaks saline into sodium and chloride ions. These highly energized ions form a plasma field strong enough to break organic molecular bonds within soft tissue causing its dissolution. Since 1950's high frequency electrosurgical apparatus have been in use. In conventional high frequency apparatus heat is made use of to cause tissue ablation and coagulation. The heat generated happens to be a double edged weapon causing collateral damage to normal tissues. Coblation is actually a beneficial offshoot of high frequency radio frequency energy. The excellent conductivity of saline is made use of in this technology. This conductivity is responsible for high energy plasma generation.

### Stages of plasma generation:



First stage – (Vapour gas piston formation):

This is characterised by transition from bubble to film boiling. This decreases heat emission and causes increase in surface temperature.

Second stage – Stage of vapour film pulsation:

Tissue ablation occurs during this stage.

Third stage – Reduction of amplitude of current across the electrodes.

Fourth stage : Dissipation of electron energy at the metal electrode surface

Fifth stage (stage of thermal dissipation of energy): This stage is essentially due to recombination of plasma ions, active atoms and molecules.

These stages explain why coblation is effective if applied intermittently. This ensures constant presence of stage of vapour film pulsation which is important for tissue ablation.

Effect of plasma on tissue:

The effect of plasma on tissue is purely chemical and not thermal. Plasma generates H and OH ions. It is these ions that make plasma destructive. OH radical causes protein degradation. When coblation is being used to perform surgery the interface between plasma and dissected tissue acts as a gate for charged particles.

In nutshell coblation causes low temperature molecular disintegration. This causes volumetric removal of tissue with minimal damage to adjacent tissue <sup>2</sup>. (Collateral damage is low).

#### Differences between coblation and conventional electro surgical devices

	Coblation Devices	Conventional Electro surgical Devices
Temperatures	40 ° C – 70 ° C	400 ° C – 600 ° C
Thermal penetration	Minimal	Deep
Effects on Target tissue	Gentle removal / Dissolution	Rapid heating, charring, burning and cutting
Effects on surrounding tissue	Minimal dissolution	Inadvertant charring / burning

Components of Coblation system:

1. RF generator

2. Foot pedal control
3. Irrigation system
4. Wand



Figure showing various components of coblator

RF generator:

This generator generates RF signals. It is controlled by microprocessor. This generator is capable of adjusting the settings as per the type of wand inserted. It automatically senses the type of the wand and adjusts settings accordingly. Manual override of the preset settings is also possible. Two settings are set i.e. coblation and cauterization. For a tonsil wand the recommended settings would be :

Coblation – 7 (plasma setting)

Cauterization – 3 (Non plasma setting)

Similarly the foot pedal has two color coded pedals. Yellow one is for coblation and the blue one is for RF cautery. This device also emits different sounds when these pedals are pressed indicating to the surgeon which mode is getting activated.

Even though coblation is a type of electro surgical procedure, it does not require current flow through the tissue to act. Only a small amount of current passes through the tissue during coblation. Tissue ablation is made possible by the chemical etching effect of plasma generated by wand. The thickness of plasma is only 100-200  $\mu\text{m}$  thick around the active electrode.

Otolaryngological surgeries where coblation technology has been found to be useful include:

1. Adenotonsillectomy
2. Tongue base reduction
3. Tongue channeling
4. Uvulo palato pharyngoplasty
5. Cordectomy
6. Removal of benign lesions of larynx including papilloma
7. Kashima's procedure for bilateral abductor paralysis
8. Turbinate reduction
9. Nasal polypectomy

There are different types of wands <sup>3</sup> available to perform coblation procedure optimally.

Tonsil and adenoid wand is the commonly used wand for all oropharyngeal surgeries. This wand will have to be bent slightly to reach the adenoid.

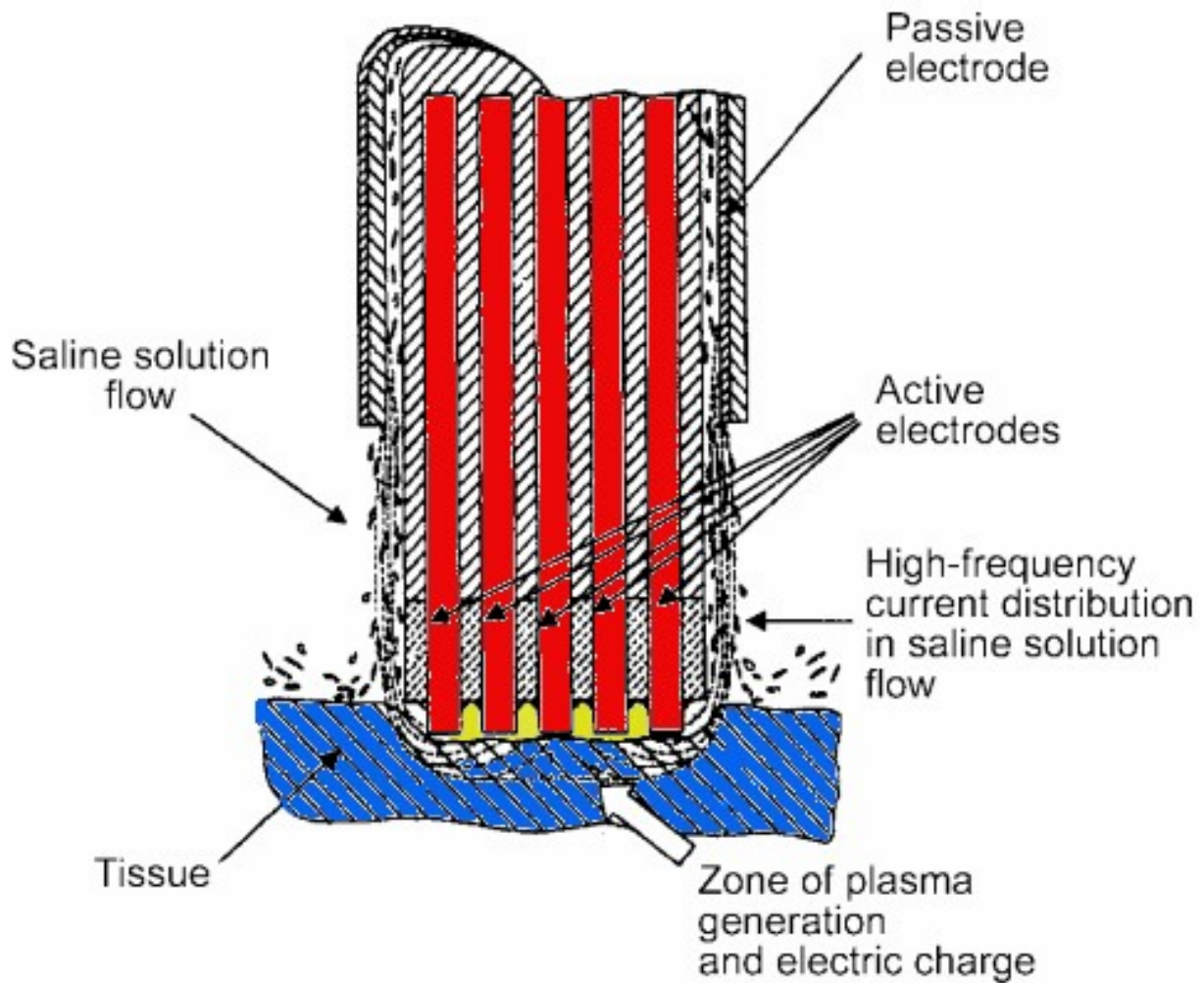
Laryngeal wand is of two types. Normal laryngeal wand which is used for ablating laryngeal mass lesions. Mini laryngeal wand is used to remove small polyps from vocal folds. The main advantage of mini laryngeal wand is its ability to reach up to the subglottic area.

Nasal wand and nasal tunnelling wands are commonly used for turbinate reduction.

Seperate tunnelling wands are available for tongue base reduction.

Equipment specification:

1. Modes of operation – Dissection, ablation, and coagulation
2. Operating frequency – 100 khz
3. Power consumption – 110/240 v, 50/60 Khz



Diagrammatic representation of coblation wand

Coblation wand has two electrodes i.e. Base electrode and active electrode. These electrodes are separated by ceramic. Saline flows between these two electrodes. Current generated flows between these two electrodes via the saline medium. Saline gets broken down into ions thereby forming active plasma which ablates tissue.

Efficiency of ablation can be improved by:

1. Intermittent application of ablation mode
2. Copious irrigation of normal saline
3. By using cold saline plasma generated becomes more efficient in ablating tissue. Cold saline can be prepared by placing the saline pack in a refrigerator over night.

Coblation is a smokeless procedure. If smoke is seen to be generated during the procedure it indicates the presence of ablated tissue in the wand between the electrodes. Hence a smoking wand should be flushed using a syringe to remove soft tissue ablated particles between the electrodes.

The generated frequency from coblator should at least be 200 kHz since frequencies lower than 100 kHz can cause neuromuscular excitation when the wand accidentally comes into contact with neuromuscular tissue.

Conclusion:

Author wishes to conclude that coblation is a promising technology in otolaryngology. Of course as with any other technology it has the cost factor built into it. The cost of wand which is meant for single use is rather high. This equipment is very useful for ablating laryngeal lesions. As far as adenotonsillectomy is concerned it adds to the cost of the surgical procedure. Performing tonsillectomy using coblation helps the surgeon to cross the learning curve rather easily. This technology has a learning curve to surmount. After getting over the curve a surgeon can efficiently handle laryngeal lesions and obstructive sleep apnoea with ease.

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## Kashima's Posterior cordectomy using coablator our experience.

Balasubramanian Thiagarajan Vrinda Balakrishnan Nair

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### Abstract:

### Aim:

To study the effectiveness of coblation technology in performing Kashima's procedure for bilateral abductor vocal fold paralysis.

### Methodology:

Managing patients with bilateral vocal fold abductor paralysis is rather tricky one. It calls for delicate balance between airway and phonation. Various endolaryngeal techniques have been used to manage this problem. Here the authors describe their experience with posterior cordectomy using coablator. This study includes 10 patients who presented with stridor following bilateral abductor paralysis. All our patients were on tracheostomy tubes. They were very anxious with the tube and wanted decannulation done. All of these patients were operated by the same senior surgeon. These patients were managed with posterior cordotomy using coblation. Laryngeal wands were used in all these patients. These patients underwent spiggoting of their tracheostomy tube on the first post operative day. Decannulation was completed on the third post operative day. Early decannulation was made possible because there was negligible soft tissue oedema as these patients underwent coblation procedure.

### Observation:

On discharge all of them had a good voice and adequate airway.

These patients were able to climb two flights of stairs without discomfort.

Although the causes of bilateral abductor paralysis of vocal cords are multifactorial post traumatic paralysis formed a large majority of our patients ( 8 who developed bilateral vocal fold paralysis following total thyroidectomy).

#### Introduction:

Bilateral vocal fold immobility is a rather common bilateral vocal fold immobility syndrome. This is commonly caused due to damage to both recurrent laryngeal nerves. Embryology has made the course of recurrent laryngeal nerves (nerve of the 6<sup>th</sup> branchial arch) rather complicated and highly variable.

Causes of bilateral abductor vocal fold paralysis include <sup>1</sup>:

1. Surgical (Commonly following post thyroidectomy) close to 59% in some studies.
2. Intubation about 25%
3. Trauma 2%
4. Neurological disorders 15%
5. Extra laryngeal malignancies 5-17% <sup>2</sup>

Clinical features of bilateral abductor paralysis of vocal folds:

1. Stridor due to airway compromise
2. Near normal voice

Dyspnoea may be varying in degree depending on <sup>3</sup>:

1. Amount of glottic chink
2. Arytenoid body mass
3. Presence / absence of comorbidity
4. Physical activity

10% of these patients need no intervention. Some of them could decompensate making them dyspnoeic <sup>4</sup>.

For centuries tracheostomy has been the gold standard in the management of bilateral abductor vocal fold paralysis. All the procedures are compared with tracheostomy to ascertain their efficacy. Introduction of Kleinsasser suspension laryngoscope revolutionised endolaryngeal surgical procedures and treatment of bilateral abductor vocal fold paralysis.

Results:

Total number of patients taken up for study = 10

Female = 7

Male = 3

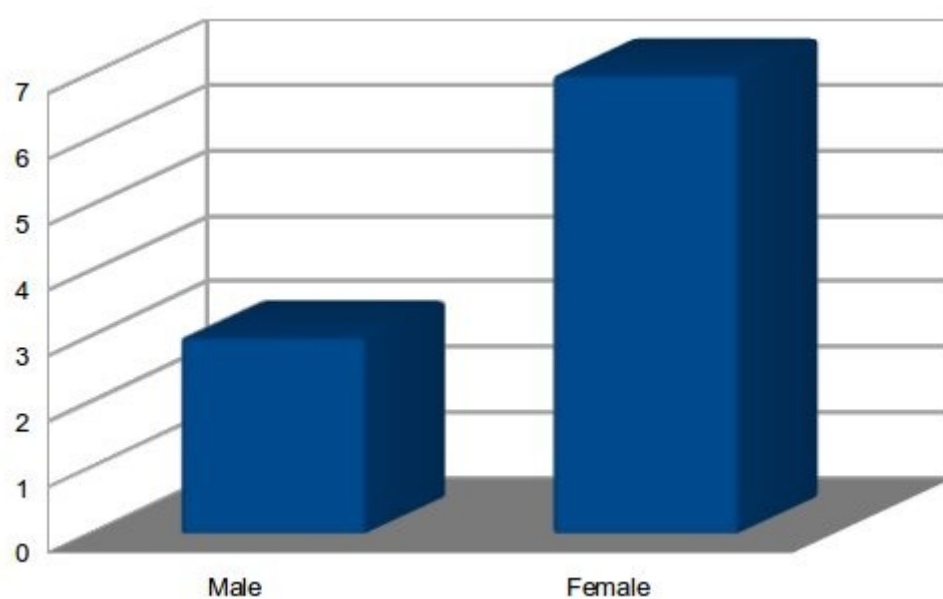


Figure showing sex distribution among patients with bilateral abductor vocal fold paralysis



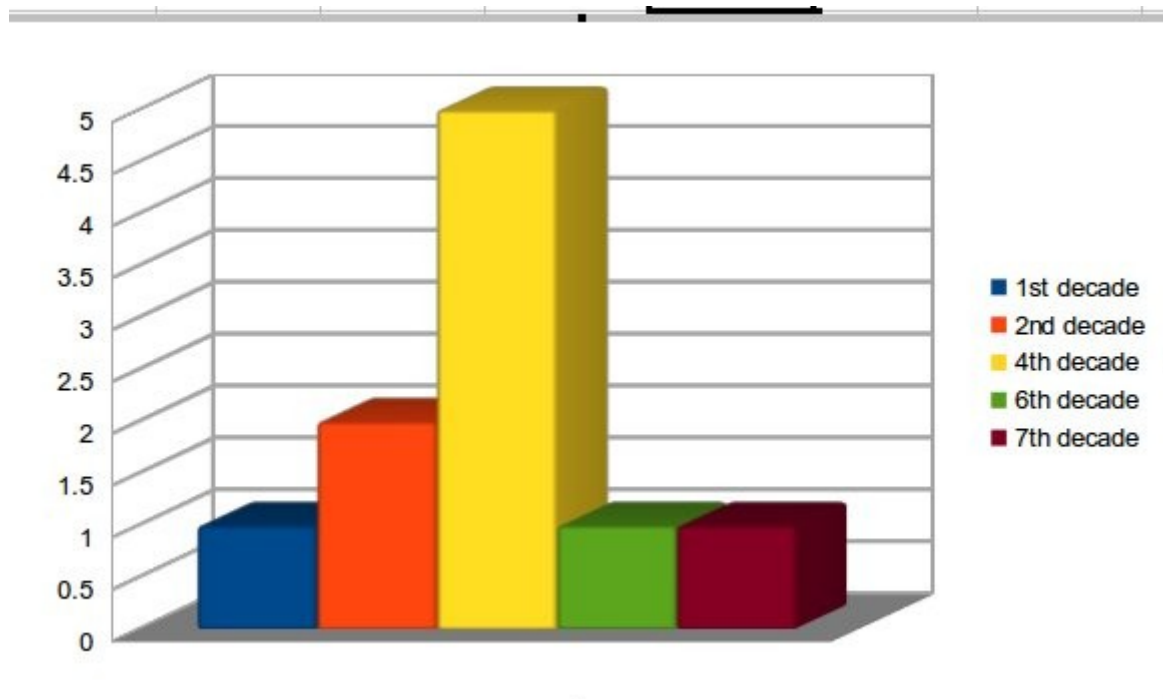


Figure showing age distribution of patients with bilateral abductor paralysis

Majority of our patients were in the 4<sup>th</sup> decade of life.

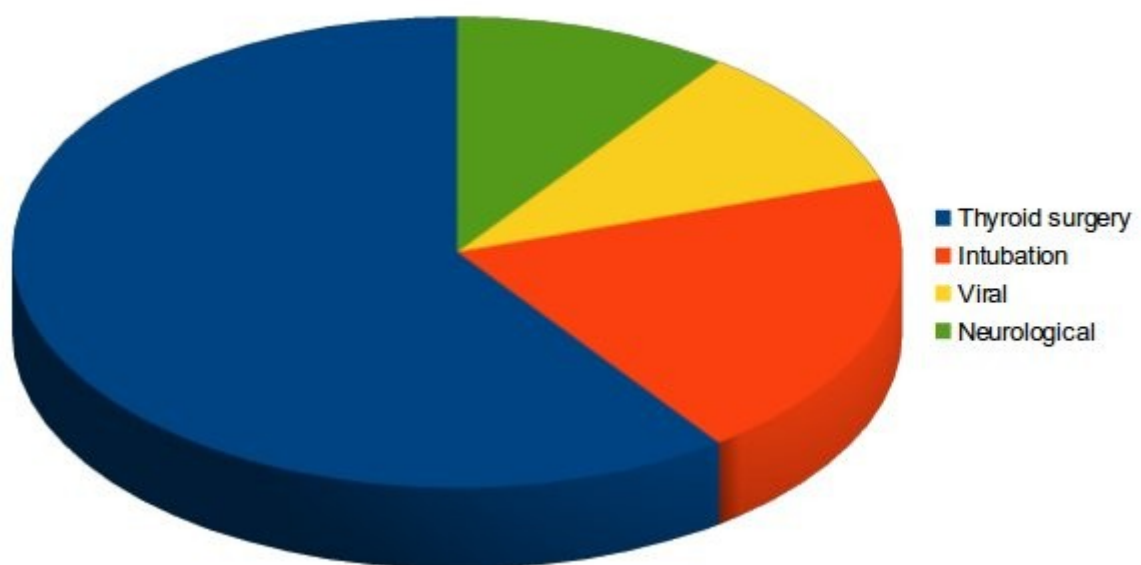


Figure showing the various etiological factors that caused bilateral abductor paralysis in our study group

Iatrogenic causes of bilateral abductor vocal fold paralysis was common in our study group. Almost all of these patients underwent total thyroidectomy.

Patients in this study were on tracheostomy for periods ranging from 2 – 10 years. None of them tolerated spigotting of the tracheostomy tube. Decanulation procedure was attempted in all of these patients but failed.

#### Procedure:

The surgical procedure introduced by Dennis and Kashima in 1989 revolutionised the management of bilateral abductor vocal fold paralysis. This technique is based on resection of soft tissues and transection of conus elasticus. A “C” Shaped wedge of posterior vocal fold is excised beginning from the free border and extending to about 4mm laterally. Basic rationale in this procedure is the release of tension of the glottic sphincter rather than actual removal of glottic tissue. If airway is not adequate then the same procedure can be carried out on the opposite side also. Reker and Rudert modified the original Kashima procedure which involved complementary resection in the body of lateral thyroarytenoid muscle anteriorly from the initial triangular incision. This produced a larger airway with good voice. 9 of our patients underwent the classic Kashima procedure while one patient underwent Reker's procedure<sup>6</sup>.

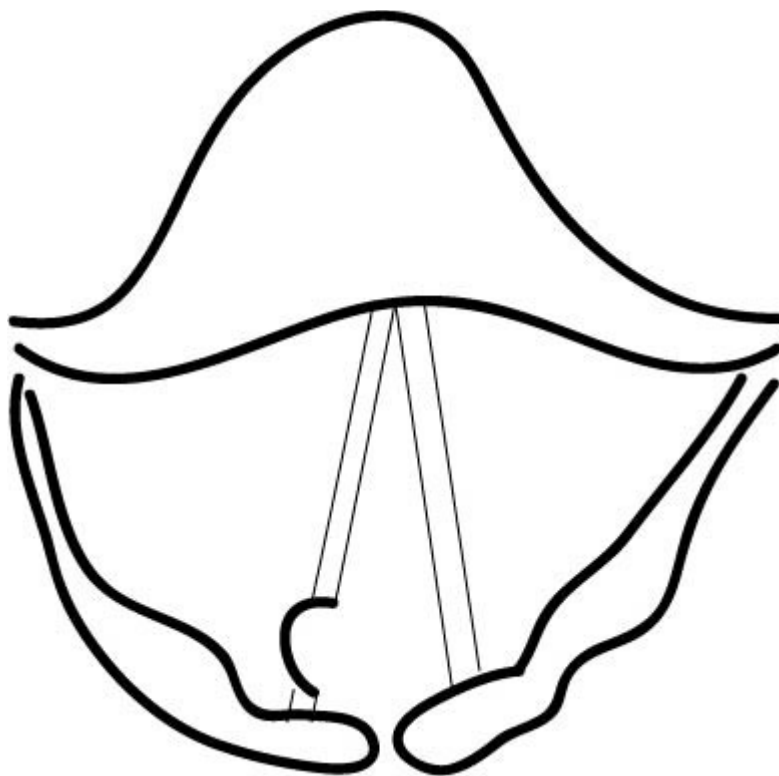


Diagram showing the site of resection in Kashima's procedure

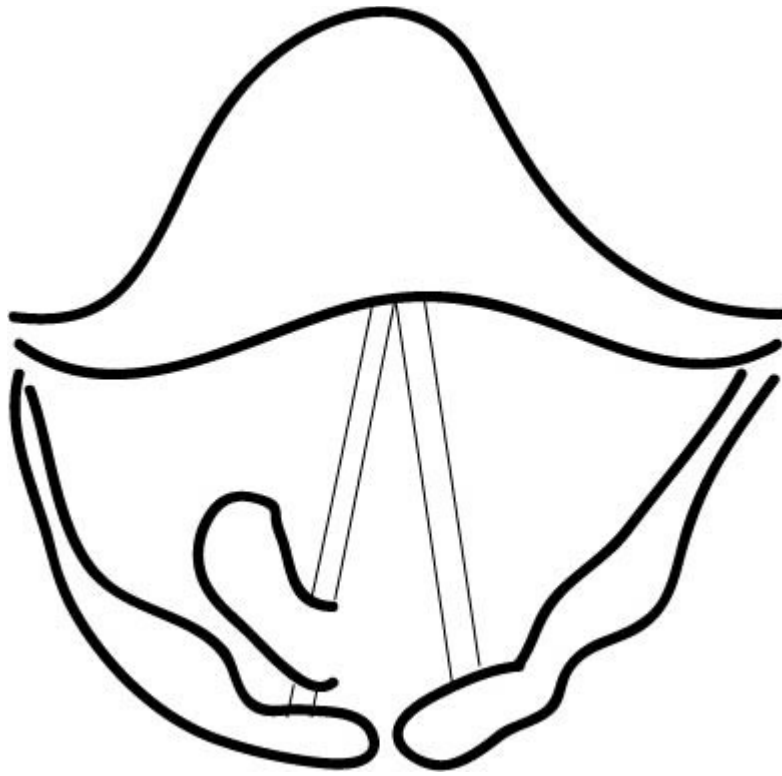


Figure showing Recker's modification of Kashima's procedure

Since all our patients were on tracheostomy, the same stoma was used for intubation for anesthesia purposes. Under general anesthesia Kleinsasser laryngoscope is used to expose the laryngeal inlet. Coblator was used for this procedure. Laryngeal wand was used to resect the posterior portion of the vocal fold.

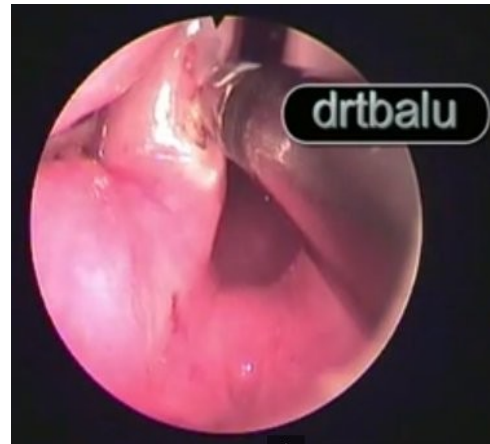
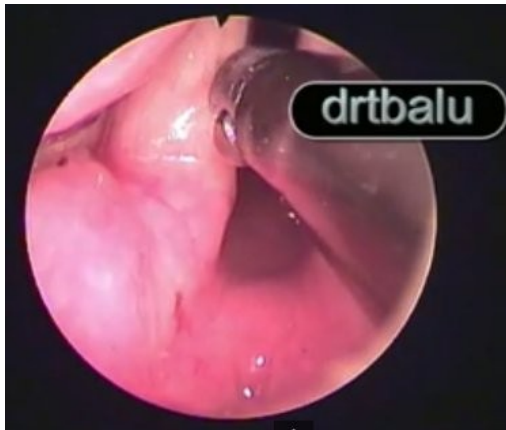


Figure showing Kashima's surgery using laryngeal wand

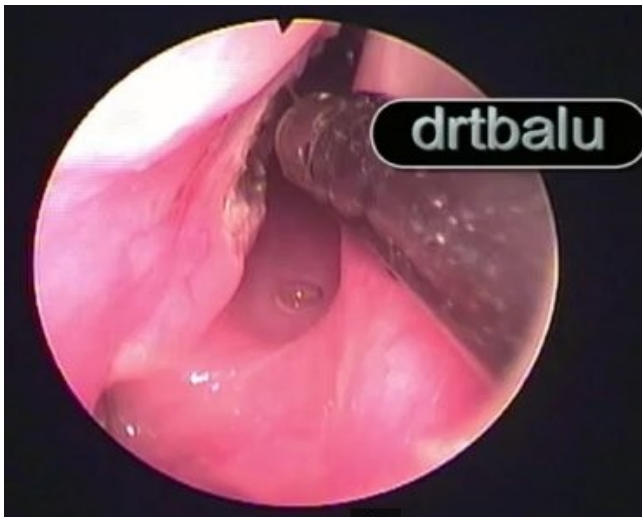


Figure showing Kashima's surgery after completion of the procedure

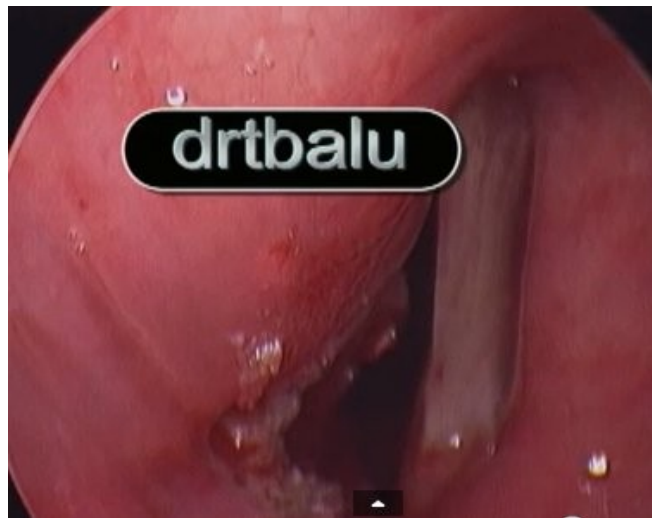


Figure showing Reker's modification of kashima's procedure

#### Conclusion:

Performing Kashima's procedure using coblation technology is really promising. Advantages of this procedure include:

1. Blood less ablation
2. Precise ablation of tissue
3. No collateral damage to adjacent tissue
4. No oedema of tissues around larynx
5. Early decanulation is possible

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## Coblation Tonsillectomy our experience

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### Abstract:

Tonsillectomy happens to be the commonly performed surgery these days. Like any other surgical procedure this surgical procedure has also undergone tremendous technological changes. One such evolving change happens to be coblation tonsillectomy. Coblation technology is actually an offshoot of radiofrequency surgery. This technique involves passing radiofrequency energy through a conductive medium like isotonic sodium chloride or potassium chloride solution. This produces a plasma field which is composed of sodium and hydroxyl ions which ablates tissue. This tissue ablation takes place at (60-70° C) which is much lower than that achieved during other electro surgical techniques (400 – 600° C). This article attempts to discuss the use of this technology to perform tonsillectomy with special emphasis on sharing our experience with the system. This study involves critical appraisal of 25 coblation tonsillectomy surgeries performed at Stanley Medical college during the year 2013.

### Introduction:

Tonsillectomy still remains the commonly performed surgical procedure. Surgical technique of tonsillectomy has undergone rapid evolution since the time of Celsus 30 BC who is credited with the first documented tonsillectomy procedure. Hook and knife method <sup>1</sup> performed by Aetius of Amida during 6<sup>th</sup> century should be considered as the first scientific attempt at removing tonsils. Paul of Aegina used forceps to completely extirpate tonsils. This laid the foundation for tonsil guillotine. George Earnest Waugh of England was the first to use careful dissection method to remove the tonsil. He is also credited with the design of Waugh's tenaculum forceps which he used to dissect tonsil out of its bed (1909). Innovations that took place like the use of diathermy, harmonic scalpel, debriider were meant to reduce the operating time and bleeding during the procedure.

Currently coblation is being attempted to remove tonsillar tissue. This process was invented by Philip E Eggers and Hira V Thapliyal in 1999. Coblation tonsillectomy received FDA approval in 2001. <sup>3</sup>

Advantages of coblation tonsillectomy:

1. Less bleeding
2. Preservation of capsule is possible if done under magnification. If capsule is preserved there is less post operative pain
3. Tonsillar reduction surgeries can be performed in young children without compromising the immunological function of the lymphoid tissue

The technology:

Coblation involves passing a radiofrequency bipolar electrical current at a much lower frequency than that of standard bipolar diathermy, through a medium of normal saline which results in the production of plasma field of sodium ions. These ions breakdown intercellular bands and in effect vaporize tissue at a temperature of only 60degrees c. The presence of saline helps to limit the amount of heat delivered to the surrounding structures and hence reduces collateral tissue damage and causes less post op pain. This is truly a bipolar system and does not need earth pad.

Methodology:

This study involves 25 patients who underwent coblation tonsillectomy. They were compared with patients who underwent cold steel tonsillectomy. This is a retrospective study involving 25 patients who underwent coblation tonsillectomy by a single surgeon (the author). The results were compared with that of cold steel tonsillectomy surgery performed by the same surgeon.

Selection criteria:

1. Random selection of patients by draw of lots
2. Children of the age group between 5-10 constituted the subjects of study
3. This study involved 50 patients out of whom 25 underwent coblation tonsillectomy while the rest underwent conventional cold steel tonsillectomy.

Data taken for analysis include:

1. Age
2. Amount of blood loss
3. Pain score
4. Post operative bleeding

Follow up was performed by a second surgeon who did not know what procedure was followed during tonsillectomy. Each of these patients were asked to fill up a questionnaire which contained specific questions relating to the time taken for them to return back to normal life.



Statistical tools were not used to analyze the data because the study number was small.

## Results:

Total number of cases taken up for study = 50

Number of patients who underwent coblation tonsillectomy = 25

Number of patients who underwent conventional cold steel tonsillectomy = 25

Average Age distribution of patients who underwent coblation tonsillectomy was = 7.16

Average Age distribution of patients who underwent conventional cold steel tonsillectomy = 7.2

Age distribution between the two study categories were more or less similar.

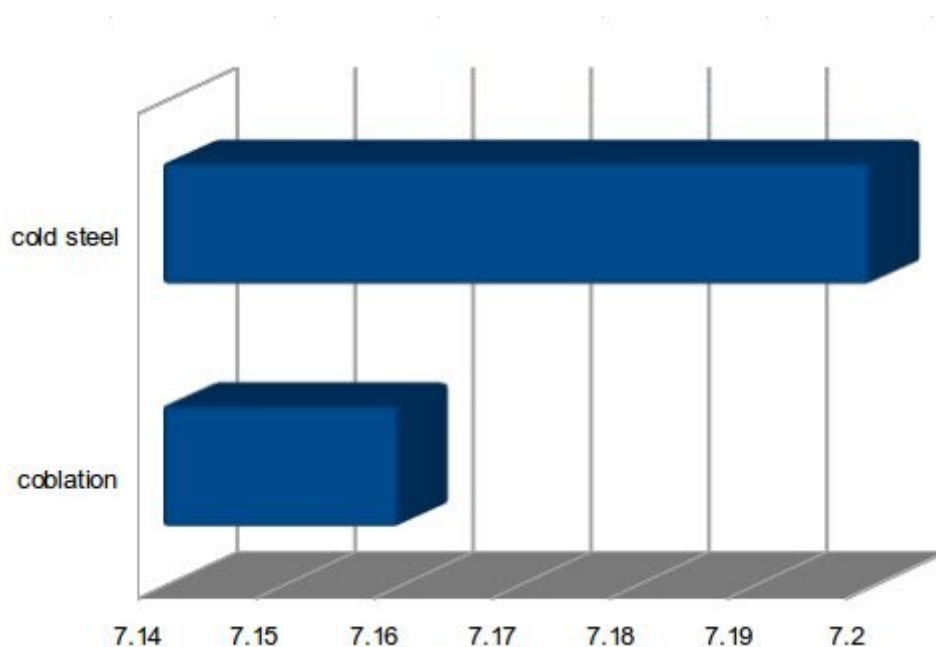


Figure showing age distribution between two study groups

Assessment of blood loss during these two procedures:

Cotton balls and gauze planned to be used during surgery should be carefully weighed before autoclaving. Used cotton and gauze should be weighed and the difference in weight is an assessment of blood contained in them. The difference in weight can be converted into milliliters by dividing the difference in weight by specific gravity (1.055).<sup>4</sup>

Saline taken in the bowl is measured and kept at 150 ml. This volume is used to keep the suction tube unclogged. This volume should be subtracted from the volume of blood inside the suction bottle. This volume added to the volume of blood loss estimated from cotton and gauze gives the volume of blood loss during the procedure.

All patients were premedicated with injection atropine which helped in reducing normal salivary secretions. Oral cavities of these patients were cleaned dry using gauze before the start of procedure.

Average blood loss of these patients was:

Coblation tonsillectomy = 86 ml

Cold steel tonsillectomy = 90 ml

These values indicate that there was no appreciable difference in blood loss between these two groups.

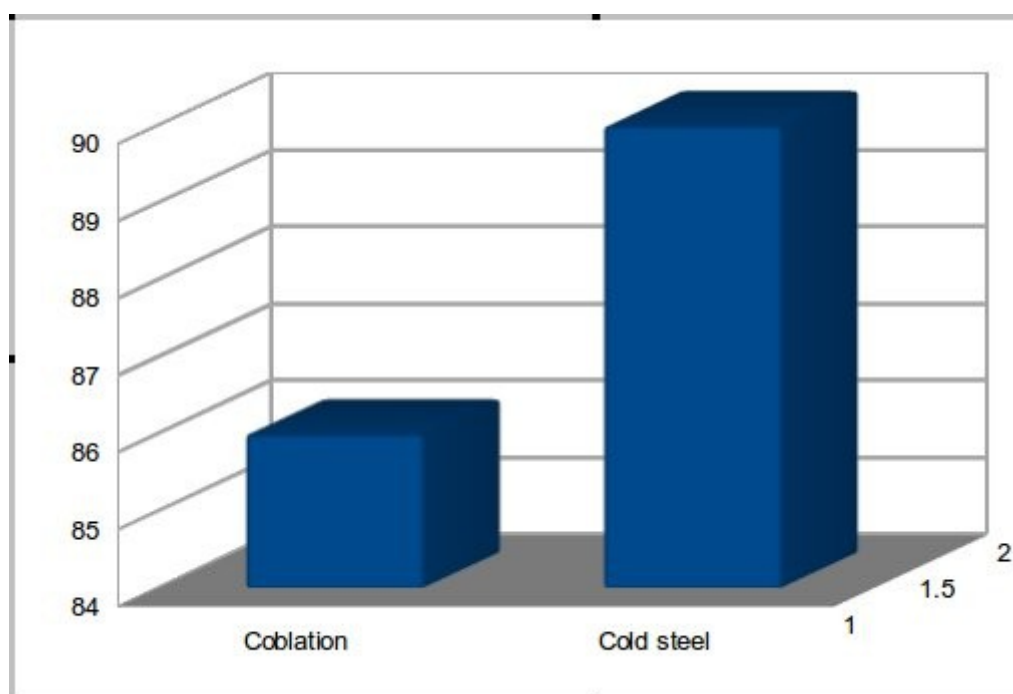


Figure showing comparison of blood loss between coblation and cold steel tonsillectomy groups

Pain score:

Pain score was calculated using Wong-Baker FACES Pain Rating scale. One child of age 3 who underwent tonsillectomy was excluded from the study since the response was unreliable.

The child is shown image containing 6 faces and is asked to choose which best describes his / her current feeling.



Coblation tonsillectomy group:

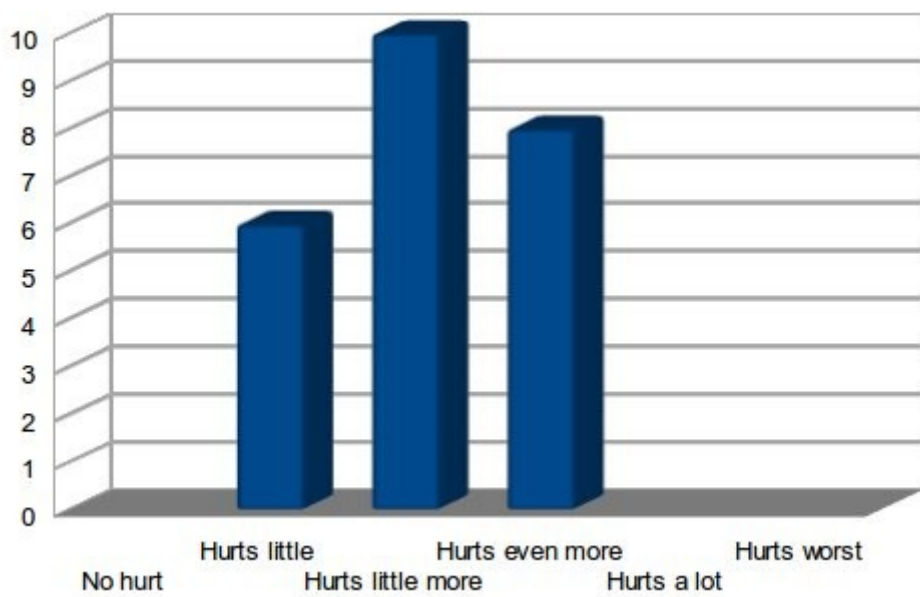
1. 6 patients choose image 2
  2. 10 patients choose image 3
  3. 8 patients choose image 4
- 1 patient was excluded since the child was 3 years old

Cold steel tonsillectomy group:

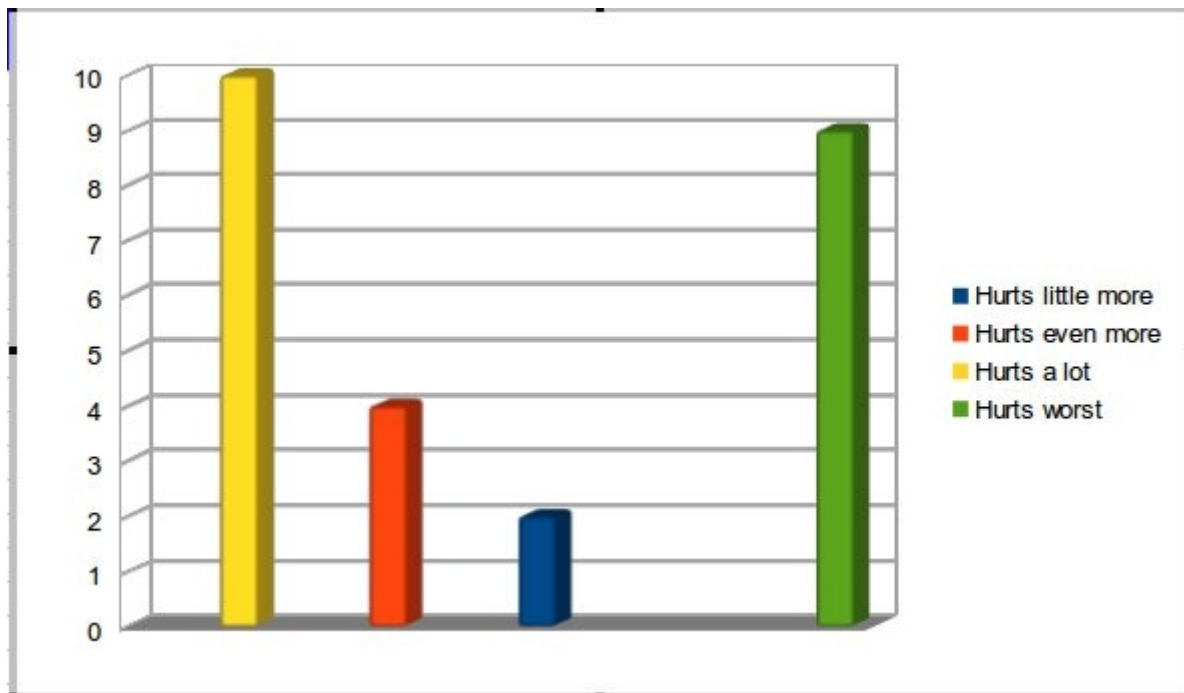
1. 10 patients choose image 5
2. 4 patients choose image 4

3. 2 patients choose image 3

4. 9 patients choose image 6



Pain score in coblation group



Pain score in cold steel tonsillectomy group

Pain scores were found to be rather high in patients who underwent cold steel tonsillectomy. This could be attributed to the extracapsular dissection which is done in coblation. Leaving behind tonsillar capsule has been postulated to reduce pain because there is less muscle exposure and irritation. Pain due to tonsillectomy has been attributed due to pharyngeal muscle spasm which is commonly seen when the muscle fibers are exposed.

#### Post operative bleeding:

Our study did not show any post operative bleeding in the cold steel tonsillectomy group. One patient belonging to coblation group developed secondary bleeding on the 8<sup>th</sup> day following surgery. Patient recovered on being treated with antibiotics<sup>5</sup>. Noon et al in their study have reported a greater incidence of post op bleeding in patients who have undergone coblation tonsillectomy.<sup>6</sup> They attributed this to the formation of healthy granulation tissue in the tonsillar fossa which had a tendency to bleed even on trivial trauma.

#### Discussion:

Coblation tonsillectomy is a recent innovation. It has evoked a lot of curiosity among otolaryngologists. Tonsillectomy has been performed commonly worldwide.<sup>7</sup>

Experience with coblation is quite recent. More and more literature is being generated world wide by people using this technology. Even though this study is limited by the number of patients studied, it gives a clear pointer to one aspect i.e. coblation tonsillectomy causes less post operative pain when compared to conventional cold steel procedure. This is due to the fact that tonsillectomy

using this procedure is extracapsular. Debulking of enlarged tonsils can also be performed preserving the immunological functions of the tonsils. This study showed no evidence of lesser post operative bleeding between the two groups under study.

#### Conclusion:

Coblation is a promising technology for otolaryngological use. Major advantage the author noticed while performing tonsillectomy is reduced post operative pain scores. Patients started eating with very little discomfort following surgery. A more comprehensive study would throw more light on this technology.

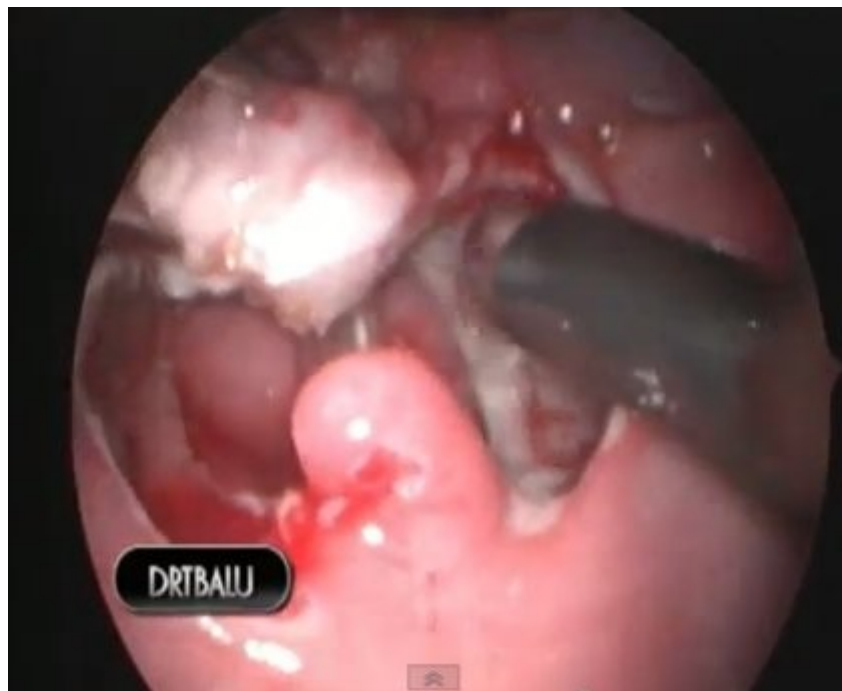


Figure showing coblation tonsillectomy being performed

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## Coblation wands

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### Abstract:

This article discusses the architecture of coblation wands used in otolaryngological surgeries. Wand happens to be the most important consumable of the coblation system. These wands are also expensive and meant only for single use. Hence this technology has a built in recurring cost factor.

### Introduction:

There are different wands available for different surgical procedures. These wands include:

1. Tonsil wand
2. Laryngeal wand
3. Microlaryngeal wand
4. Nasal wand
5. Needle wands for tongue base reduction and turbinate reduction

### Tonsil wand:

This wand is also known as Evac 70 wand. It has a triple wire molybdenum electrode. This triple wire electrode is very useful for tissue ablation. Its bipolar configuration suits efficient hemostasis. The shaft is malleable and hence can be bent to suit various anatomical configurations of oral cavity. It can also be bent so much that adenoids can be reached via the



oral cavity route under the soft palate. It has integrated suction and irrigation facility. Normal saline is used for irrigation purposes. Normal saline acts as a medium through which Radio frequency current passes causing release of plasma. This integrated irrigation and suction facility obviates the necessity of separate suction during surgical procedures.



Figure showing Tonsil wand

Tonsil wand happens to be the work horse of the entire system. It is also the most commonly used wand. The basic advantages of tonsil wand are:

1. Plasma generated by the electrodes are optimized for adequate tissue ablation
2. The depth of injury is very less and hence there is no collateral tissue damage

3. The temperature generated between the electrodes is 40-70° C. This temperature does not cause airway fire and it is hence safe to use.
4. The presence of multiple electrodes ensures quick and stable establishment of plasma layer, maintains the stability of the plasma layer and also maximizes the plasma layer.

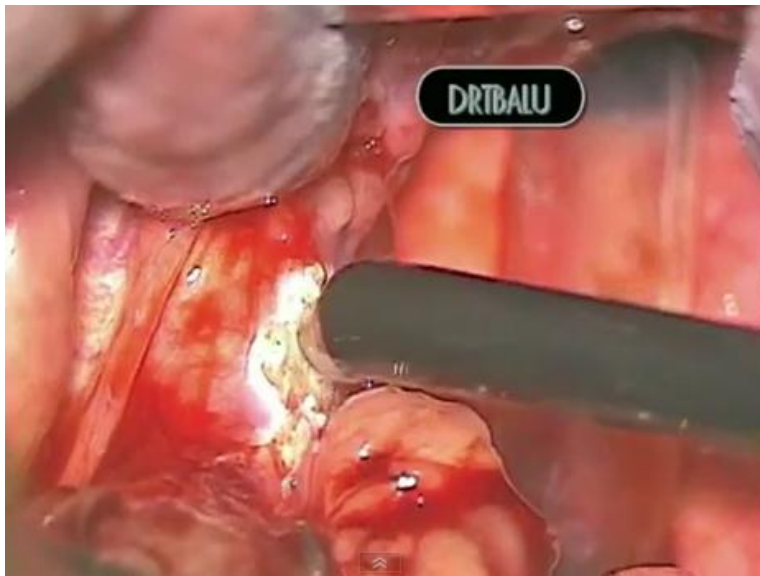


Figure showing tonsillar wand in action

Microlaryngeal wand:

This wand is designed for precise and controlled ablation of laryngo tracheal lesions. Its shaft is thin and long. It provides ablation, coagulation, suction and irrigation in the same set up. Its increased length facilitates tissue ablation from the anterior commissure of larynx and upper trachea. It also does not obstruct vision of the surgeon.

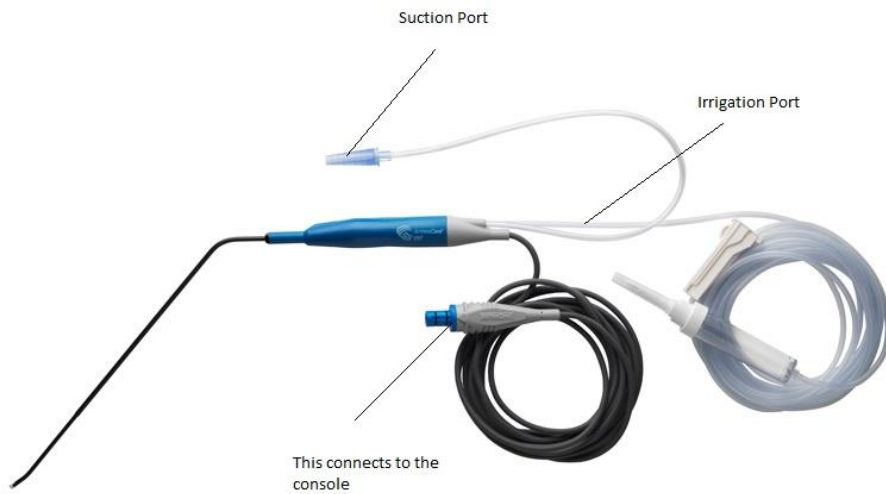


Figure showing Microlaryngeal wand

#### Laryngeal wands:

This wand is very useful for controlled ablation of bulky or sessile laryngeal lesions. It has built in ablation, irrigation, coagulation and suction capabilities. The length of this wand is suitable for ablating lesions from larynx and anterior commissure areas. Its curvature does not obstruct vision. It does not have the risk of air way fires which is possible with conventional electro surgical equipment.<sup>1</sup>

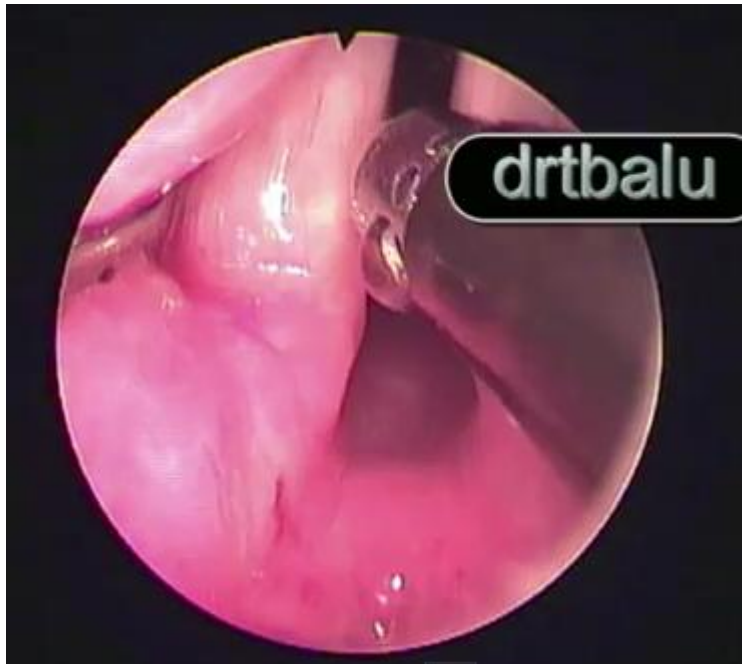


Figure showing laryngeal wand in action

#### Turbinate reduction wand:

This wand is a needle type wand. Saline should be infiltrated into the turbinate tissue before performing the actual procedure. This wand does not have an irrigation portal hence the tissue needs to be infiltrated with a mixture of 2% xylocaine with 1 in 100,000 units adrenaline admixed with normal saline. These wands are also known as Reflex Ultra wands. These wands are designed to perform minimally invasive procedures. Sub mucosal channeling procedures can be performed using this wand<sup>2</sup>. Reflex Ultra 45 is used for turbinate reduction<sup>3</sup>.

#### Tongue base reduction wand:

Reflex Ultra 55 wand is used for tongue base reduction and soft palate reduction. This is usually performed to treat snoring.



Figure showing Reflex Ultra wand

All these reflex ultra channeling wands have depth limiters. This helps in limiting the depth of sub mucosal penetration.

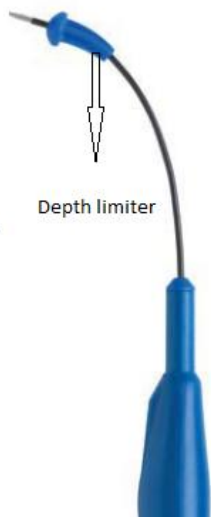


Figure showing Reflex ultra wand with depth limiter

Coblation wands can work in two settings:

1. Non plasma power setting
2. Plasma power setting

Differences between Non plasma and Plasma power settings:

Non Plasma power setting 1-5	Plasma power setting 6-9
No plasma layer is formed	Plasma layer is formed
Tissue not removed	Tissue removed
Deeper depth of penetration	Shallow depth of penetration
Lower voltages used	Higher voltages used
Temperature generated is more	Temperature generated is less
Cellular vibration / oscillation	Molecular dissociation

The color of Plasma glow generated at the tip of the wand varies depending on the medium used for irrigation. The tip of the wand glows yellow if sodium chloride is used as irrigation medium and orange if the irrigation medium happens to be potassium chloride solution.

Tips:

1. Copious irrigation with normal saline is a must
2. Colder the irrigating fluid better is the result (overnight refrigeration of saline packs is preferable)
3. Plasma power setting should be used for best results
4. Wand should not dig into the tissue
5. Wands are meant for single use only. Multiple uses not only fails to generate plasma but also causes increased incidence of wound infection
6. Wands should be handled with extreme care to make it last till the end of the case

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## Coblation adenoidectomy our experience

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### Abstract:

Aim of our study is to compare the efficacy and safety of coblation adenoidectomy versus conventional cold steel adenoidectomy. The study design included 40 children between age groups 4 – 8. Twenty of these children underwent coblation adenoidectomy while the other group of 20 underwent conventional cold steel adenoidectomy. The parameters taken into consideration for comparison included Post operative pain, operating time, intraoperative bleeding and presence of residual adenoid tissue 6 weeks after surgery.

In this study the coblation group demonstrated less post operative pain, less intraoperative bleeding and more complete removal of adenoid tissue. Operative time was found to be significantly higher in coblation group when compared to conventional cold steel adenoidectomy group.

### Introduction:

Adenoid is the lymphoid aggregation seen in the nasopharynx. This tissue is a component of inner Waldeyer's ring. This tissue undergoes hypertrophy till the child reaches the age of 4 after which the proportional increase of the size of nasopharynx makes it appear reduced in size which



is followed by a reduction of symptoms. Adenoidectomy is the commonly performed surgery in children. As with any other surgical procedure there are complications associated with adenoidectomy. These complications are fortunately rare <sup>2</sup>.

Various methods of performing adenoidectomy include:

1. Conventional cold steel technique using curette
2. Bipolar coagulation under endoscopic vision
3. Adenoidectomy using microdebrider <sup>3</sup>
4. Coblation adenoidectomy

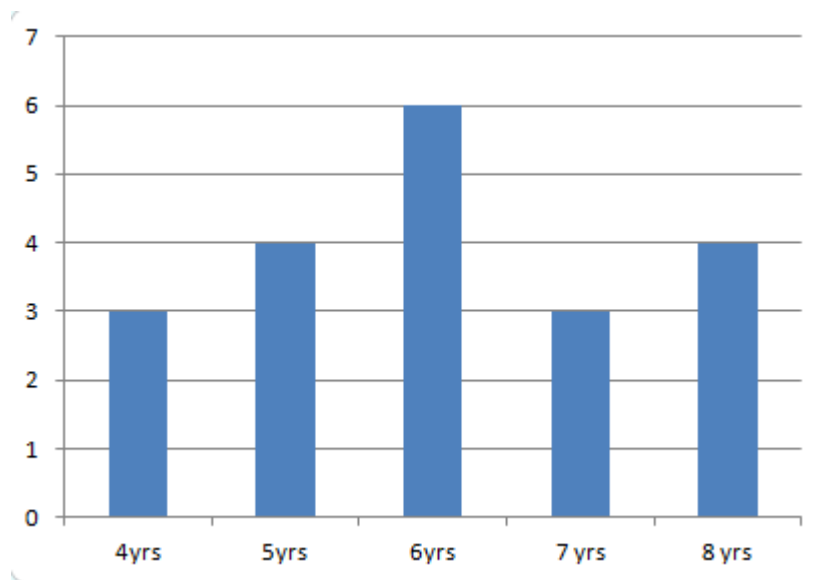
For purposes of classification and management adenoid hypertrophy has been graded according to the size of the tissue taking into consideration the relationship of the hypertrophied tissue with vomer, soft palate and torus tubaris <sup>4</sup>.

Grade	Anatomical structure in contact with adenoid tissue
Grade I	None
Grade II	Torus tubaris
Grade III	Torus tubaris, Vomer
Grade IV	Torus tubaris, Vomer and soft palate at rest

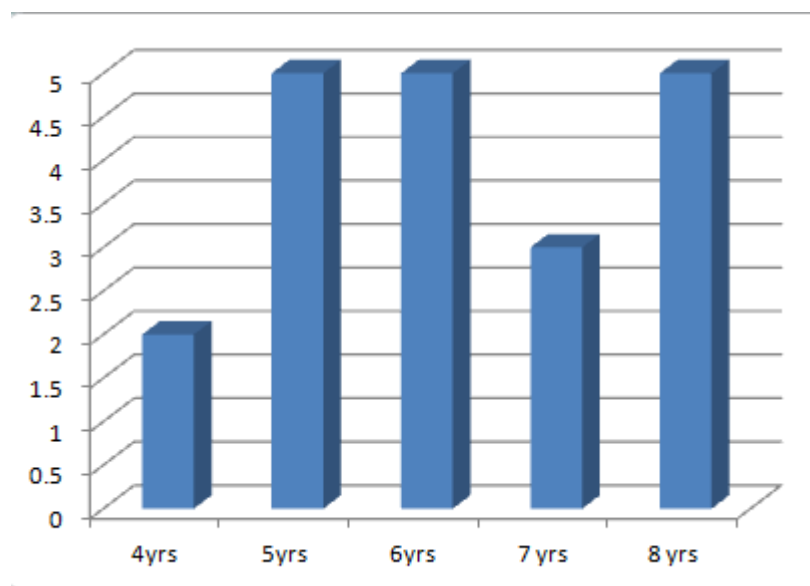
Materials and methods:

Pediatric patients of age group ranging between 4 and 8 were included in the study. Parents of the children taken up for study were not aware of the procedure followed during surgery. Patients were chosen randomly for the procedure by an intern by draw of lots. This random choice averted surgeon bias <sup>5 6</sup>. All the surgical procedures were performed by the same surgeon. Children with co morbid conditions like anemia, upper and lower respiratory infections were excluded from the study.

The size of adenoid tissue was graded using the grading system discussed above. Size of adenoid is assessed by performing diagnostic nasal endoscopic examination under topical anesthesia.



Age distribution of patients who underwent coblation adenoidectomy



Age distribution of patients who underwent cold steel adenoidectomy

#### Procedure:

Cold steel adenoidectomy was performed in a classic manner using conventional instruments. Blood loss is calculated by weighing the gauze pre operatively and post operatively. Gauze should be weighed before sending them for autoclaving.

Coblation adenoidectomy was performed by putting the patient in head up position. Soft palate is retracted by passing a soft rubber catheter via the nasal cavity. Adenoid tissue is visualized by passing a 0 degree 2.7 mm nasal endoscope. Oral cavity is kept open by using a Boyles Davis mouth gag. Tonsillectomy wand is bent in such a way that it could be passed under the soft palate. Coblation of adenoid tissue is performed under visualization. Adenoid is ablated till the prevertebral fascia becomes visible. Adenoid tissue behind the tubal orifice can also be ablated.

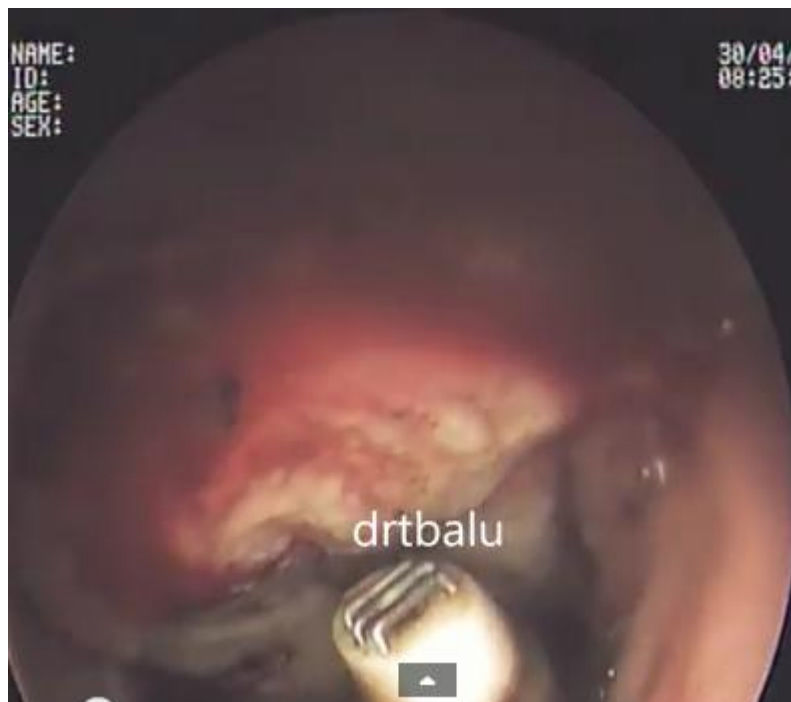


Image showing ablation of adenoid tissue using coblation

## Result:

Bleeding after conventional adenoidectomy was higher than that of bleeding after coblation tonsillectomy. On an average blood loss following conventional adenoidectomy was 50 ml while it was 20 ml for coblation adenoidectomy.

Operating time of coblation adenoidectomy was significantly higher than that of conventional adenoidectomy. On an average it took 20 minutes to perform coblation adenoidectomy while it took just 5 – 7 minutes to perform conventional adenoidectomy.

Amount of residual adenoid tissue was assessed in both categories of patients by performing nasal endoscopy using 2.7 mm 0 degree nasal endoscope in all these patients. The amount of residual adenoid tissue was significantly higher in conventional adenoidectomy when compared to that of coblation technique.

## Conclusion:

Coblation technique ensures complete removal of adenoid tissue with minimal bleeding. This helps in early resolution of secretory otitis media. Adenoid tissue present behind the tubal tonsil can also be removed safely using coblation technique. Coblation technique does not exert undue pressure over atlanto occipital joint because the patient is not put in Rose position and the wand also does not exert pressure over the area. Incidence of Grisel syndrome in both these groups will make an interesting study provided it includes a large study group.

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